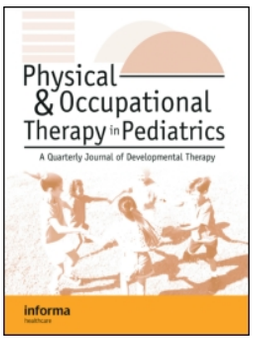

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Physical Therapists Are Key to Hip Surveillance for Children with Cerebral Palsy: Evaluating the Effectiveness of Knowledge Translation to Support Program Implementation

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ABSTRACT

Aims: Physical and occupational therapists play a key role in the implementation of hip surveillance for children with cerebral palsy (CP) in British Columbia, Canada. We aimed to develop and assess a knowledge translation strategy to support the implementation of a provincial hip surveillance program.

Methods: Pediatric therapists were invited to participate in an anonymous survey assessing hip surveillance knowledge and learning needs. Based on these results, educational materials were developed. Two years later, one year following the launch of the hip surveillance program, the survey was repeated to assess learning, knowledge use, and barriers to enrollment.

Results: The initial survey was completed by 102 therapists; 74 therapists completed the second survey. Multifaceted educational strategies, including web-based learning, in-person education, email notifications, and print materials that targeted knowledge gaps were developed. Upon re-evaluation, knowledge increased on all questions. At follow-up, 45 therapists had enrolled a child, indicating knowledge use. Barriers to enrollment included lack of a CP diagnosis, parents or physicians not agreeing to enrollment, time requirements, and lack of space to complete the clinical exam.

Conclusions: Targeted knowledge translation strategies were successful in meeting the educational requirements of a large group of therapists in a vast geographic area.

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cerebral palsy; hip; surveillance; knowledge translation; survey

Population based studies have shown that one in three children with cerebral palsy (CP) will have hip displacement (Connelly et al., 2009; Hagglund et al., 2007; Soo et al., 2006). Progressive hip displacement is associated with increased likelihood of pain and decreased quality of life (Jung et al., 2014; Ramstad & Terjesen, 2016). Osseous reconstructive hip procedures are recommended to relocate the hip and ensure the hip

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remains mobile and pain-free into adulthood (El-Sobky et al., 2018; Rutz et al., 2015). Left untreated, the hip can dislocate and cartilage on the femoral head may be lost. Salvage surgeries, which include femoral-head resections, arthrodesis, and replacement arthroplasty, may be required if the hip is painful and the severity of the damage prevents reconstruction (Shore & Graham, 2017). These procedures are associated with inconsistent pain relief, increased risk of complications, and high rates of surgical revisions making them less desirable options (Boldingh et al., 2014; Kolman et al., 2016).

Hip surveillance for children with CP has become the recommended standard of care to identify progressive hip displacement (Shrader et al., 2019). Hip surveillance, which includes clinical and radiological exams at standardized intervals, is the process of identifying and monitoring early indicators of hip displacement (Wynter et al., 2011). Together with timely orthopedic intervention, hip surveillance has been shown to decrease the incidence of hip dislocations and prevent the need for salvage hip procedures (Connelly et al., 2009; Dobson et al., 2002; Hagglund et al., 2014; Kentish et al., 2011).

A review of hip surgeries completed at British Columbia's Children's Hospital, the major pediatric treatment, teaching and research hospital in British Columbia (BC), Canada, found that 29% of hip surgeries in children with CP between September 2004 and June 2010 were salvage hip procedures (Miller, O'Donnell, et al., 2019). Prompted by the large number of salvage procedures, the development of a province-wide hip surveillance program was initiated. During program planning, a multi-disciplinary group of 50 stakeholders were brought together to develop a provincial implementation plan. Together, these key stakeholders created a detailed implementation plan for hip surveillance that was built on existing resources and keeping children within their home communities (Miller, Mayson, et al., 2020). Physical therapists (PTs) providing early intervention (0–5 years) and school aged (5–19 years) services identified themselves as being the most appropriate member of a child's local healthcare team to enroll children in hip surveillance and complete the required clinical exam. PTs noted they were already following these children, had established relationships with families, and had the required skills to complete the clinical exam. If a child did not have a PT, occupational therapists (OTs) were identified as the next most appropriate healthcare team member to complete the enrollment and clinical exam. Pediatric PTs and OTs work in 35 child development centers and 59 school districts throughout the province, which spans over 1 million square kilometers.

This foundational work was used to establish the Child Health BC Hip Surveillance Program for Children with Cerebral Palsy, the first provincial or state-wide hip surveillance program in North America. While anyone can identify a child for hip surveillance, the child's PT (or OT) is asked to review the program with the family and complete the enrollment, including a short clinical exam (Miller, Mayson, et al., 2020). All information is submitted to the program's coordinator (a PT) and medical lead (an orthopedic surgeon) at BC Children's Hospital. Based on these findings and surveillance guidelines, recommendations are made by the team at BC Children's Hospital. When surveillance is next due, the child's PT is contacted by the program to complete the clinical exam.

Once the program's provincial implementation strategy was established, a knowledge translation (KT) plan to initiate practice change among the province's pediatric therapists was required. KT is defined as a dynamic process that includes synthesis,

dissemination, exchange, and application of knowledge to improve health, health services and products, and strengthen the health care system (Canadian Institutes of Health Research, 2012). The Knowledge to Action (KTA) framework outlines steps to guide KT initiatives (Graham et al., 2006). After identifying a problem, the action portion of the KTA cycle includes determining the knowledge-practice gap, adapting knowledge to the local context, identifying barriers, and selecting, tailoring, and utilizing strategies to improve use of knowledge. Following KT interventions, the KTA cycle shifts to monitoring knowledge use and sustaining ongoing knowledge use. These steps were followed in developing a KT strategy to meet the needs of pediatric PTs and OTs working in various clinical practice settings throughout the province.

The objective of this project was to evaluate educational strategies to improve therapists' knowledge related to hip displacement and hip surveillance. Initial experiences with program enrollment and barriers to enrollment were also evaluated.

Methods

Ethics approval was not obtained for these surveys as this work was part of clinical practice and quality improvement. Quality improvement studies used exclusively for assessment, management, or improvement purposes do not constitute research and do not fall under the scope of the Research Ethics Board review (Office of Research Ethics, n.d.). All survey responses were anonymous.

Participants

Prior to launch of the hip surveillance program, pediatric therapists working in early intervention, school aged programs, or private practice in the province were invited to complete an anonymous online survey (Appendix 1). The survey link was emailed to 130 PTs and OTs known to the authors. The survey link was also emailed to subscribers of a provincial pediatric therapy resource that distributes learning resources to subscribers and participants were asked to forward the link to colleagues. The survey was repeated two years later (survey 2) using the same method of reaching therapists. Additionally, all therapists who contacted the program coordinator and requested that they receive hip surveillance program information via email were invited to complete the second survey.

Procedure

The initial survey was developed to assess therapists' knowledge, beliefs, and learning needs related to hip displacement and surveillance. Participants were first asked questions related to their experience, practice setting, and caseload related to children with CP. A five point Likert scale was used to assess support, familiarity, confidence, and current practice related to hip surveillance and its components (radiological and clinical exams). Six multiple choice and five true/false questions were used to assess clinical knowledge about hip surveillance and CP. Two additional multiple choice questions were cases; therapists were asked to identify the Gross Motor Function Classification System (GMFCS) level based on a description of motor function. Multiple choice

questions allowed therapists to select "I don't know" if they were unfamiliar with the concept being assessed.

To support the development and distribution of KT materials, therapists were asked to identify their comfort in gathering information through different KT methods and their preferred methods of being informed of new information. The survey concluded with open ended questions related to specific preferences, resources currently used for getting information, and general comments.

Intervention strategy

Based on the survey results, a multi-faceted KT strategy was developed. A freely accessible online learning module was developed and included sections on hip displacement and the evidence for hip surveillance, the process of completing hip surveillance in BC, and how to identify GMFCS levels and a group IV hemiplegic gait pattern. Videos of how to complete the clinical exam components, children at different GMFCS levels, and different gait patterns were included. Print material, including written clinical exam instructions and clinician booklets, were created. Parent booklets were written and translated into 5 languages to support therapists in discussing the program with parents and caregivers. These materials were widely and purposefully distributed through provincial distribution lists and mailed to all child development centers and school district PTs. A program webpage was developed to house all program materials and ensure the materials were easily accessible (www.childhealthbc.ca/hips). Webinars and in-person presentations were conducted. E-mail communications were also utilized to provide surveillance program updates and on-going education.

Mapping of pediatric early intervention and school therapy services was undertaken when preparing to launch the hip surveillance program. Contact information for all child development centers and school therapists were gathered and service providers for rural and remote areas were identified. Gaps in PT services were noted; OTs were identified in these areas. This work served to ensure that all therapists were known to the program coordinator and could be directly contacted to provide KT materials.

Evaluation of learning and knowledge use

Two years after the initial survey and one year post full provincial implementation of the hip surveillance program, the survey was repeated to assess learning and knowledge use. Additional questions related to therapist satisfaction with the program, knowledge about the program, and barriers to enrolling children were included (Appendix 1). Therapists were asked what they would change about the enrollment process and how we could support them through the process.

Data analysis

Reponses to the survey questions were summarized using descriptive statistics. Categorical variables were described with frequencies and percentages. For questions assessing change in knowledge or confidence, Chi squared or Fisher exact tests were used. A p-value of less than 0.05 was considered significant.

Results

The initial survey was completed by 102 therapists while the follow up survey was completed by 61 respondents with another 12 providing partial responses. All answers provided were included in the analysis. When asked to recall if they had completed the initial survey, 46% (29) reported they had, while 14% (9) did not and 40% (30) could not recall. Survey 2 was completed by a greater proportion of PTs but other demographics showed a similar distribution for practice settings, community populations served, and caseloads as they relate to children with CP (Table 1).

Table 1. Summary of therapist characteristics and caseload (CP: cerebral palsy).

	Survey 1 (n = 102)	Survey 2 (n = 74)
Profession		
Physical therapist	83 (81.4%)	69 (93.2%)
Occupational therapist	16 (15.7%)	2 (2.7%)
Dual trained	3 (2.9%)	3 (4.1%)
Years of clinical experience		
0 – 5 years	11 (10.8%)	8 (10.8%)
6–10 years	14 (13.7%)	8 (10.8%)
11-15 years	14 (13.7%)	9 (12.2%)
16-20 years	19 (18.6%)	19 (25.7%)
21+ years	44 (43.1%)	30 (40.5%)
Years in pediatrics		
0 – 5 years	21 (20.8%)	12 (16.2%)
6–10 years	22 (21.6%)	14 (18.9%)
11–15 years	15 (14.9%)	11 (14.9%)
16–20 years	15 (14.9%)	18 (24.3%)
21+ years	29 (28.7%)	19 (25.7%)
Practice setting		
Metro (>190,000)	41 (40.2%)	34 (45.9%)
Urban/Rural (40,001 – 190,000)	36 (35.3%)	27 (36.5%)
Rural (10,001 – 40,000)	18 (17.6%)	9 (12.2%)
Remote (<10,000)	7 (6.9%)	4 (5.4%)
Age of Clientele (select all that apply)		
Infants & toddlers: birth to 2 years	64 (62.7%)	46 (62.2%)
Preschool: 2–5 years	67 (65.7%)	48 (64.9%)
School: 5–13 years	78 (76.5%)	50 (67.6%)
Adolescents: 13–19 years	68 (66.7%)	45 (60.8%)
Percentage of Caseload with cerebral palsy		
0 – 20%	41 (40.2%)	34 (45.9%)
21 – 40%	22 (21.6%)	21 (28.4%)
41 – 60%	21 (20.6%)	11 (14.9%)
61 – 80%	12 (11.8%)	7 (9.5%)
81 – 100%	4 (3.9%)	1 (1.4%)
Frequency of seeing children with CP		
Annually or less than annually	4 (3.9%)	1 (1.4%)
Every 6 – 12 months	6 (5.9%)	4 (5.4%)
Every 4 – 6 months	4 (3.9%)	5 (6.8%)
Every 2 – 4 months	19 (18.6%)	18 (24.3%)
Monthly	36 (35.3%)	31 (41.9%)
More than monthly	33 (32.4%)	15 (20.3%)
Location of treatment (select all that apply)		
Child's home	88 (86.3%)	59 (79.7%)
Child development center	64 (62.7%)	43 (58.1%)
Hospital	14 (13.7%)	10 (12.2%)
Rehabilitation center	15 (14.7%)	9 (12.2%)
School	65 (63.7%)	45 (60.8%)
Private clinic	5 (4.9%)	4 (5.4%)
Other	34 (33.3%)	25 (33.8%)

Table 2. Comparison of survey results of questions related to current beliefs and practices related to hip surveillance (CP: cerebral palsy; BC: British Columbia).

Level of agreement		1 Not at all	2	3	4	5 Very great deal	P value
I think hip displacement in children with CP is a problem that requires standardized monitoring	Survey 1	1.0%	0%	2.9%	19.6%	76.5%	0.278
	Survey 2	0%	0%	4.1%	10.8%	85.1%	
I identify Gross Motor Function Classification System (GMFCS) levels for all of my clients with CP	Survey 1	5.9%	10.8%	11.8%	22.5%	49.0%	0.083
	Survey 2	1.4%	2.7%	8.1%	24.3%	63.5%	
I routinely complete a clinical exam with the intent of identifying hip displacement	Survey 1	19.6%	20.6%	18.6%	27.5%	13.7%	0.365
	Survey 2	10.8%	16.2%	24.3%	28.3%	20.3%	
I am familiar with hip migration percentage measure of hip displacement	Survey 1	22.5%	18.6%	15.7%	26.5%	16.7%	0.001
	Survey 2	5.4%	8.1%	20.3%	29.7%	36.5%	
I am familiar with the BC Consensus Statement on Hip Surveillance for Children with CP	Survey 1	18.6%	20.6%	25.5%	18.6%	16.7%	< 0.001
	Survey 2	0%	9.5%	17.6%	24.3%	48.6%	

Therapists' responses regarding their beliefs and current practices related to hip surveillance are shown in Table 2. Reported level of confidence in completing the components of hip surveillance are reported in Table 3. Confidence increased in all areas assessed, but most notably in determining how frequently a child with CP should have a clinical exam or hip x-ray and identifying a Group IV hemiplegic gait pattern.

Table 4 provides percentages of correct responses to knowledge questions. Improved knowledge was noted in all questions, though not all reached significance. Assigning GMFCS levels to case scenarios improved between the two surveys. No respondents reported being unfamiliar with the GMFCS classification system levels at the time of survey 2, a decrease from 3.9% of respondents who reported they were not familiar with it in survey 1. The number of therapists indicating they were not familiar with a Group IV hemiplegic gait pattern decreased from 71.6% in survey 1 to 14.3% in survey 2.

Table 5 shows therapists' comfort with different formats for gathering information utilized in day to day practice. Professional/academic websites, clinical experts, and special interest groups were the most commonly identified methods therapists currently used for getting information. Most (96.1%) wanted to be informed of new information via email. At follow-up, 74.6% of respondents had visited the program's website, 73.0% were aware of the e-learning module, and 84.1% were aware of information booklets for professionals.

At the time of the second survey, 72.6% (45/62) of therapists reported having enrolled a child in the hip surveillance program. Most were "satisfied" (40%) or "very satisfied" (51%) with the enrollment process. Five therapists requested changes to the enrollment forms. Forms were described as lengthy and cumbersome. One therapist recommended

Table 3. Comparison of survey results related to confidence in completing the components of hip surveillance (GMFCS: Gross Motor Function Classification System; CP: cerebral palsy).

Level of confidence		1 Not at all	2	3	4	5 Very great deal	P-value
Identifying which children require hip surveillance	Survey 1	4.9%	12.7%	28.4%	28.4%	25.5%	0.012
	Survey 2	0%	5.4%	16.2%	40.5%	37.8%	
Determining a child's GMFCS Level	Survey 1	4.9%	5.9%	7.8%	26.5%	54.9%	0.022
	Survey 2	0%	1.4%	4.2%	45.8%	48.6%	
Determining that a child has Group IV hemiplegia	Survey 1	18.6%	16.7%	17.6%	24.5%	22.5%	< 0.001
	Survey 2	1.4%	6.9%	20.8%	47.2%	23.6%	
Measuring hip abduction range of motion with hips at 0 degrees of flexion and knees extended	Survey 1	5.9%	4.9%	16.7%	28.4%	44.1%	0.209
	Survey 2	1.4%	2.8%	14.1%	43.7%	38.0%	
Determining how frequently a child with CP should have a clinical exam	Survey 1	15.7%	20.6%	22.5%	24.5%	16.7%	< 0.001
	Survey 2	2.8%	5.6%	20.8%	29.2%	41.7%	
Determining how frequently a child with CP should have a hip x-ray	Survey 1	16.7%	21.6%	24.5%	22.5%	14.8%	< 0.001
	Survey 2	2.8%	6.9%	19.4%	34.7%	36.1%	
Knowing when a child should be seen by an orthopedic surgeon regarding their hips	Survey 1	6.8%	18.6%	27.5%	25.5%	21.6%	0.284
	Survey 2	2.8%	11.1%	23.6%	33.3%	29.2%	

having all information requiring parent feedback on one page while another requested that referrals be done in stages where essential information is provided initially and the remainder completed at a later date.

Barriers to enrollment are listed in Table 6. Additional barriers included challenges reaching families or having parents sign and return the enrollment forms when seeing the child at school, uncertainty about whether the child was already enrolled in the program, and proximity to a neighboring province where families seek services. Multiple comments reiterated the challenge of discussing the program with parents when a child lacked a CP diagnosis. One therapist commented that "parents are not ready to have the discussion as the child has not been officially diagnosed". Another therapist wrote when a child does not have a CP diagnosis it "has required a long-winded explanation from me about what CP is and whether I think their child does or does not have this diagnosis". Therapists requested we support them by educating pediatricians about the diagnosis of CP, providing regular updates to practice leaders, conducting webinars on CP diagnosis and hip surveillance, and clarifying role responsibilities. It was noted that additional family education materials, particularly for families where English is their second language, would be helpful. Two therapists requested additional resources and funding to complete hip surveillance.

Table 4. Questions and percentage of therapists answering knowledge questions related to hip displacement and surveillance correctly (T: True; F: False; GMFCS: Gross Motor Function Classification System; MP: migration percentage; CP: cerebral palsy; ABI: acquired brain injury; n/a: not assessed; BCCH: BC Children's Hospital).

	Correctly answered		
Question topic	Survey 1 (n = 102)	Survey 2 (n = 63)	P-value
True/False Knowledge Questions			
Risk of hip displacement increases with GMFCS level (T)	96.1%	98.4%	1.0
Surveillance involves clinical and radiological exams (T)	98.0%	98.4%	1.0
Pain always accompanies displacement (F)	94.1%,	96.8%,	0.71
Clinical exam findings are poor indicator of hip displacement (T)	45.6%	57.1%	0.22
Hip displacement is directly related to motor type (F)	51.0%	61.3%	0.21
Multiple Choice Knowledge Questions			
GMFCS Level III Case	77.4%	90.5%	0.05
GMFCS Level IV Case	80.4%	85.7%	0.51
Identify Group IV hemiplegic gait pattern	24.5%	63.5%	< 0.001
Definition of MP	79.4%	95.2%	0.010
Referral to Orthopedics with MP of 30%	46.1%	90.5%	< 0.001
Discharge from surveillance	52.9%	77.8%	0.012
CP Knowledge Questions			
Conditions considered CP			
Motor dysfunction from perinatal brain injury	99.0%	100%	1.0
Motor dysfunction from genetic or metabolic cause	74.5%	74.6%	1.0
Motor dysfunction from an ABI during the first 2-3 years of life	91.2%	85.7%	0.4
Conditions that are not CP			
Motor dysfunction from spinal nerve injury	84.3%	90.5%	0.37
Motor dysfunction from muscular origin	94.1%	98.4%	0.35
True/False Program Questions – Survey 2 Only			
Enrollment does not require a doctor's referral (T)	n/a	95.2%	n/a
All children enrolled see an Orthopedic surgeon at BCCH (F)	n/a	81.0%	n/a
A diagnosis of CP is required for enrollment (F)	n/a	77.8%	n/a
Children should not be enrolled until age 2 (F)	n/a	88.9%	n/a
Children at GMFCS I & II, over age 5, should be enrolled (T)	n/a	74.6%	n/a

Discussion

Implementation of the Child Health BC Hip Surveillance Program for Children with Cerebral Palsy is based on the collaborative work of PTs and OTs in child development centers and schools throughout the province. Successful implementation of this new program required a change in their practice. In asking community PTs to play a key role in the hip surveillance program, we aimed to understand and support their learning needs. The survey results show that using a multifaceted, targeted KT strategy was effective in increasing knowledge and confidence related to hip surveillance in community therapists within a geographically vast area. Knowledge use and change in practice was demonstrated by the number of survey respondents who reported they had enrolled a child in the program.

Knowledge testing questions, barriers to knowledge use, and facilitators to change were assessed in the initial survey to aid in developing KT tools that would support local practice change (Graham et al., 2006). Therapists were supportive of hip surveillance and reported seeing children at a frequency needed to follow the provincial hip surveillance guidelines but they were not always utilizing GMFCS levels, completing a clinical exam for hip surveillance, or familiar with the provincial hip surveillance

Table 5. Therapists' comfort with varying formats for gathering information utilized in day to day practice.

Level of comfort	1 (Not at all)	2	3	4	5 (A very great deal)
Website	0 (0.0%)	2 (2.0%)	4 (3.9%)	37 (36.3%)	59 (57.8%)
Self-paced online learning modules	1 (1.0%)	6 (5.9%)	11 (10.8%)	30 (29.4%)	54 (52.9%)
Webinars	1 (1.0%)	8 (7.8%)	12 (11.8%)	32 (31.4%)	49 (48.0%)
Telehealth presentations	7 (6.9%)	12 (11.8%)	19 (18.6%)	23 (22.5%)	41 (40.2%)
Instructional video	2 (2.0%)	3 (2.9%)	15 (14.7%)	35 (34.3%)	47 (46.1%)
Email	2 (2.0%)	2 (2.0%)	13 (12.7%)	36 (35.3%)	49 (48.0%)
Printed brochures	7 (6.9%)	5 (4.9%)	21 (20.6%)	29 (28.4%)	40 (39.2%)
Articles in peer-reviewed journals	0 (0.0%)	9 (8.8%)	19 (18.6%)	39 (38.2%)	35 (34.3%)
Mobile device application (App)	21 (20.6%)	16 (15.7%)	22 (21.6%)	27 (26.5%)	16 (15.7%)
Professional communications	5 (4.9%)	6 (5.9%)	24 (23.5%)	39 (38.2%)	28 (27.5%)
Regional knowledge broker	7 (6.9%)	9 (8.8%)	24 (23.5%)	35 (34.3%)	27 (26.5%)
In-person workshop	0 (0.0%)	3 (2.9%)	9 (8.8%)	35 (34.3%)	55 (53.9%)
Person available to contact	2 (2.0%)	2 (2.0%)	13 (12.7%)	36 (35.3%)	49 (48.0%)

Table 6. Barriers to enrollment.

Potential barrier	Number of therapists reporting
There is no one who is appropriate on my caseload	6
I don't know who is appropriate	0
I think the child is appropriate but they don't have a diagnosis of CP	4
Family physician or pediatrician didn't support enrollment into program	7
I haven't found the time	12
Parents don't agree with enrollment	13
I don't have the space to complete the clinical exam	8
I don't think it's my responsibility	1
Other	8
None of the above	25

guidelines. Specific gaps in knowledge, including measuring hip abduction and identifying gait patterns, were identified. Identification of these gaps in knowledge and practice informed the materials developed.

When considering how to share information, practice change is most likely to occur when active, multi-component KT interventions are utilized (Menon et al., 2009). Respondents were very comfortable with online learning formats, including webinars, learning modules, and instructional videos. A recent review found online education curriculums were an effective KT strategy used by health care professionals in child health settings (Campbell et al., 2019). The creation of an online learning module with interactive videos demonstrating clinical exam components and classification of gait patterns was likely a key tool in increasing knowledge. Communication via email was highly requested by therapists and was established early by the program coordinator. This ensured that therapists knew the program coordinator was easy to contact, a request from survey respondents, and offered a means of communicating education and program updates regularly. These emails acted as program reminders which have been shown to change health professional behaviors (Cheung et al., 2012). Communication has since been expanded to include quarterly e-mails with regional enrollment updates,

answers to frequently asked questions, and research updates to ensure messaging is received often and repeatedly.

Overall, there was an improvement in all scores of knowledge and confidence. The number of respondents that reported being familiar with the BC Consensus on Hip Surveillance, the guidelines used to determine frequency of surveillance, and feeling confidence in knowing when a child needed a clinical exam and hip x-ray increased significantly. In addition, key requirements for therapists to successfully enroll children and complete a clinical exam increased significantly, including understanding migration percentage and a Group IV hemiplegic gait pattern. Surveillance guidelines are based on GMFCS levels and, therefore, knowledge and use of this classification system is critical. Results showed improvement in the knowledge, use, and confidence related to the GMFCS though did not reach statistical significance. The knowledge about CP and hip surveillance demonstrated by therapists in both surveys was equivalent or exceeded the knowledge demonstrated by pediatricians in the province who completed a similar survey (Miller, Mulpuri, et al., 2019).

In the KTA framework, the sustainability phase should set in motion a feedback loop that cycles through the action phases (Graham et al., 2006). The follow-up survey offered the opportunity to identify continued gaps in knowledge that need to be addressed in future KTA cycles. Common misconceptions about hip surveillance, including the use of clinical exam findings as an indicator for hip displacement and a relationship between motor type and hip displacement, remained high in the follow up survey with up to 40% of therapists believing these to be true. While no therapists identified not knowing who was appropriate for enrollment as a barrier, only 38% of therapists in the follow up survey were "very confident" identifying which children require surveillance. Knowledge of the BC Consensus on Hip Surveillance increased significantly but more than 25% of respondents still did not report being familiar (Likert 4 or 5) with these guidelines. To support program implementation and sustain knowledge, further education is required on these topics. In addition, with 15–20% of all respondents reporting less than 5 years' experience in pediatrics, continuous education is anticipated to educate new therapists.

Enrollment rates in the surveillance program can be used to quantify practice change. One year after the hip surveillance program began, there were survey respondents who had not enrolled a child in the program. These findings suggest that some therapists had not yet changed their practice despite widespread support for hip surveillance and standardized monitoring. This is another indication that continued KT efforts are required. Evaluation of regional enrollment rates is now routinely reviewed to evaluate where additional KT strategies are required, particularly in rural and remote regions of the province. In these cases, more targeted strategies are being employed to therapists and physicians. Additionally, regional statistics aid in identifying regions lacking PT services; OTs in these areas are approached directly to participate in surveillance. Ensuring OTs in these areas are knowledgeable about hip surveillance will be key to ensuring all children in the province have access to this program.

Asking therapists to identify barriers to enrollment also provides key insights into ongoing KT needs. Uncertainty over whether a child is enrolled and proximity to a neighboring province were reported barriers and suggest that communication needs to be improved regarding who to contact to determine if a child is enrolled and that children should be enrolled even when receiving orthopedic care outside the province.

Time constraints is a common barrier to implementing new knowledge and was one of the most common barriers identified by survey respondents (Bennett et al., 2016; Willoughby et al., 2019). Other environmental barriers included lack of space to complete the clinical exam and difficulty connecting with parents of school-aged children. Strategies such as getting consent on the phone, using virtual visits, and omitting the measurement of hip abduction have been developed based on this feedback.

In a review of health professionals' experiences with implementing hip surveillance, Willoughby et al. (2019) reported that limited communication between clinicians and lack of clarity in lines of responsibility were barriers to surveillance in Victoria, Australia. Only one therapist in our survey suggested clarifying role responsibilities when asked how we could support them. These barriers may have been less of a concern in British Columbia due to differences in how hip surveillance is implemented in our province. In our model, PTs can refer children to the program without a physician referral and a child's family and healthcare team receives direct communication from the program when surveillance is due. Of note, a substantial number of therapists reported no barriers to enrollment.

Survey results also highlighted the need for KT strategies for pediatricians and families. The lack of a CP diagnosis was reported as a barrier to enrollment. Therapists described the challenge of approaching families about hip surveillance for children they suspected had CP but had not yet been diagnosed. When asked how we could provide support, respondents requested education for pediatricians about the diagnosis of CP. Recent publications have noted the importance of diagnosing CP early and providing a clinical diagnosis of CP when a genetic or metabolic etiology is diagnosed to ensure children have access to surveillance programs (Novak et al., 2017; MacLennan et al., 2019). Parents or a physician not agreeing with enrollment were also identified as barriers. Similarly, Willoughby et al. (2019) found parent engagement was one of the most frequently reported barriers. They noted hip surveillance is more likely to be successful when parents have knowledge of the need for hip surveillance. In a study of parent experience with hip surveillance, Toovey et al. (2020) found that parents valued knowledge, clear communication, and co-ordination of care while also highlighting that having an x-ray can be challenging. Evaluation of barriers to enrollment and execution of surveillance from parents' perspective is required in our local context.

There are limitations with these survey results. Fewer therapists responded to the second survey, which may not be as representative of the population of pediatric therapists as survey 1. The number of OTs completing the survey dropped from 15.7% to 2.7% of respondents. OTs are only involved in completing hip surveillance when a child does not have a PT. Their limited involvement with the program likely contributed to fewer completing the follow-up survey. The predominance of PTs completing the second survey may account for some of the improvements in scores related to gross motor function and gait. However, PTs are the primary referral source for the hip surveillance program and thus the results reflect the group for whom we are most concerned with assessing. The survey was distributed directly to individual PTs but was also sent through existing e-mail distribution lists. It is unknown how many therapists received the survey request and so the response rate cannot be determined. It is possible that therapists who were more supportive of hip surveillance responded resulting in bias in the responses received.

The coronavirus disease-2019 (COVID-19) has resulted in PTs being unable to assess children in person. To facilitate continuing surveillance, therapists have been encouraged to enroll children and complete the clinical exam virtually, omitting assessment of hip abduction. Evaluation of how therapists in our province foresee COVID-19 impacting their ability to complete hip surveillance clinical exams, identify new children for enrollment in the program, and communicate with the program coordinator is currently underway. These results will be used to determine how we can support therapists to ensure services are maintained during the pandemic.

Conclusions

Multifaceted KT strategies delivered purposefully and repeatedly have been effective in meeting the learning needs of therapists when implementing a province-wide hip surveillance program for children with CP. Evaluation of learning and assessment of barriers to program enrollment have identified knowledge gaps and problems requiring additional KT efforts, including ensuring an early diagnosis of CP and investigating the learning needs of families and pediatricians.

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